



## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

<b>(51) International Patent Classification <sup>6</sup> :</b> C12N 5/04, 5/14, 15/05, 15/31, 15/63, 15/82, A01H 1/00, 5/00	<b>A1</b>	<b>(11) International Publication Number:</b> WO 99/45101 <b>(43) International Publication Date:</b> 10 September 1999 (10.09.99)
<b>(21) International Application Number:</b> PCT/US99/04716 <b>(22) International Filing Date:</b> 3 March 1999 (03.03.99)  <b>(30) Priority Data:</b> 60/076,627 3 March 1998 (03.03.98) US  <b>(63) Related by Continuation (CON) or Continuation-in-Part (CIP) to Earlier Application</b> US 60/076,627 (CIP) Filed on 3 March 1998 (03.03.98)  <b>(71) Applicant (for all designated States except US):</b> THE SCRIPPS RESEARCH INSTITUTE [US/US]; 10550 North Torrey Pines Road, La Jolla, CA 92037 (US).  <b>(72) Inventors; and</b> <b>(75) Inventors/Applicants (for US only):</b> PADIDAM, Malla [IN/US]; 1141 Snyder Road B-21, Lansdale, PA 19446 (US). BEACHY, Roger, N. [US/US]; 526 East Polo Drive, St. Louis, MO 63105 (US). FAUQUET, Claude, M. [FR/US]; 13339 Grand Via Pt., Del Mar, CA 92130 (US).	<b>(74) Agents:</b> FITTING, Thomas et al.; The Scripps Research Institute, 10550 North Torrey Pines Road TPC-8, La Jolla, CA 92037 (US).  <b>(81) Designated States:</b> AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GE, GH, GM, HR, HU, ID, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).  <b>Published</b> With international search report.	
<b>(54) Title:</b> RESISTANCE IN PLANTS TO INFECTION BY ssDNA VIRUS USING <i>INOVIRIDAE</i> VIRUS ssDNA-BINDING PROTEIN, COMPOSITIONS AND METHODS OF USE  <b>(57) Abstract</b>  The invention describes methods for producing plant resistance to a ssDNA virus, particularly a geminivirus such as mastrevirus, curtovirus or begomovirus. The method comprises introducing a ssDNA-binding protein of the <i>Inoviridae</i> virus into the plant, and includes a phage coat protein, particularly, a coliphage gene 5 protein. The invention also describes a transgenic plant comprising a gene that expresses the ssDNA-binding protein and vectors for expressing the protein in plants.		

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## INTERNATIONAL SEARCH REPORT

International application No.  
PCT/US99/04716

**A. CLASSIFICATION OF SUBJECT MATTER**

IPC(6) : C12N 5/04, 5/14, 15/05, 15/31, 15/63, 15/82; A01H 1/00, 5/00  
US CL : Please See Extra Sheet.

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 435/69.1, 320.1, 410, 418, 419, 468; 536/23.72; 800/278, 279, 280, 288, 295, 298, 301

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

Agricola, Caplus, Medline, APS

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A,P	PADIDAM et al. A Phage Single-Stranded DNA (ssDNA) Binding Protein Complements ssDNA Accumulation of a Geminivirus and Interferes with Viral Movement. J. Virol. February 1999, Vol. 73, No. 2, pages 1609-1616, see whole document.	1-6, 8, 10, 12-41, 44-48
A	PADIDAM et al. Tomato Leaf Curl Geminivirus From India Has A Bipartite Genome And Coat Protein Is Not Essential For Infectivity. J. Gen. Virol. 1995, Vol. 76, pages 25-35, see whole document.	1-6, 8, 10, 12-41, 44-48
Y	HORSCH et al. A Simple And General Method For Transferring Genes Into Plants. Science. 08 March 1985, Vol. 227, pages 1229-1231, see whole document.	13, 14, 16, 33, 34, 35, 44, 45, 46-48

☒ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents:	*T* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
*A* document defining the general state of the art which is not considered to be of particular relevance	*X* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
*E* earlier document published on or after the international filing date	*Y* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
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*O* document referring to an oral disclosure, use, exhibition or other means	
*P* document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search

20 MAY 1999

Date of mailing of the international search report

14 JUN 1999

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## INTERNATIONAL SEARCH REPORT

International application No.  
PCT/US99/04716

## C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	SANFORD et al. Optimizing The Biolistic Process for Different Biological Applications. Meth. Enzymol. 1993, Vol. 217, pages 483-509, especially pages 504-508.	12, 16, 35
Y	BATES, G. W. Electroporation Of Plant Protoplasts And Tissues. Meth. Cell Biol. 1995, Vol. 50, pages 363-373, especially pages 365-370.	12, 16, 35
A	TIMMERMANS et al. Geminiviruses And Their Uses As Extrachromosomal Replicons. Annu. Rev. Physiol. Plant Mol. Biol. 1994, Vol. 45, pages 79-112, especially pages 81-95.	1, 17, 18, 19, 20, 21, 22, 24, 36, 37

# INTERNATIONAL SEARCH REPORT

International application No.  
PCT/US99/04716

## Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This international report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:  
because they relate to subject matter not required to be searched by this Authority, namely:
  
2. ☒ Claims Nos.: 7, 9, 11, 31, 32, 42, 43, 49, 50  
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:  
  
the claims encompass the use of nucleotide sequences identified by SEQ ID NOs. However, the submitted CRF does not comply with the sequence rules, and was not entered. Consequently, the sequences could not be searched.
  
3. ☐ Claims Nos.:  
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

## Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
  
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
  
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
  
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest.  
☐ No protest accompanied the payment of additional search fees.

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International application No.

PCT/US99/04716

## A. CLASSIFICATION OF SUBJECT MATTER:

US CL :

435/69.1, 320.1, 410, 418, 419, 468; 536/23.72; 800/278, 279, 280, 288, 295, 298, 301